

WHAT IS CLAIMED IS:

1. A wheel rotation detecting device, comprising:  
a rolling bearing unit including:

5 a stationary ring supported on a suspension and being  
unrotatable in use;

a rotary ring supporting a wheel thereon and being  
rotatable with said wheel; and

10 a plurality of rolling elements respectively rollably  
interposed between a stationary side raceway formed in  
a peripheral surface of said stationary ring and a rotary  
side raceway formed in a peripheral surface of said rotary  
ring;

15 an encoder supported on said rotary ring or on a part  
mounted on said rotary ring and being rotatable with said rotary  
ring;

a first sensor supported on said stationary ring or a  
part mounted on said stationary ring in such a manner as to  
be opposed to said encoder, for detecting the rotation of said  
rotary ring; and

20 at least one second sensor disposed within a holder holding  
said first sensor, for detecting the condition of said rolling  
bearing unit.

25 2. The wheel rotation detecting device as set forth  
in claim 1, wherein said second sensor includes a temperature

sensor for detecting the temperature of said rolling bearing unit.

3. The wheel rotation detecting device as set forth  
5 in claim 1, wherein said second sensor includes a vibration sensor for detecting the vibration of said rolling bearing unit.

4. The wheel rotation detecting device as set forth  
10 in claim 1, wherein said second sensor includes a temperature sensor for detecting the temperature of said rolling bearing unit and a vibration sensor for detecting the vibration of said rolling bearing unit.

5. The wheel rotation detecting device as set forth  
15 in claim 1, wherein said holder holding said first and second sensors is made of synthetic resin.

6. The wheel rotation detecting device as set forth  
20 in claim 5, wherein said holder made of synthetic resin is retained within a case made of non-magnetic material.

7. The wheel rotation detecting device as set forth  
in claim 2, wherein said temperature sensor is disposed on  
25 a leading end of said holder in such a manner as to be situated

near to and opposed to a peripheral surface of said rotary ring.

8. The wheel rotation detecting device as set forth  
5 in claim 3, wherein said vibration sensor is disposed in series with said first sensor in an axial direction of said holder, and nearer to a base end side of said holder than said first sensor in the axial direction of said holder.

10 9. The wheel rotation detecting device as set forth in claim 3, wherein said vibration sensor has a function detecting vibrations at least in two directions.

15 10. The wheel rotation detecting device as set forth in claim 9, wherein the vibration in the two directions is detected by properly selecting the number of said vibration sensors, the mounting directions thereof, and the kinds thereof.

20 11. The wheel rotation detecting device as set forth in claim 9, wherein the vibration in three directions is detected by properly selecting the number of said vibration sensors, the mounting directions thereof, and the kinds thereof.

25 12. The wheel rotation detecting device as set forth

in claim 1, wherein said encoder is magnetized along a circumferential direction thereof and said encoder includes S and N poles disposed on a peripheral surface thereof such that said S and N poles are alternately situated at regular intervals along the circumferential direction thereof.

13. The wheel rotation detecting device as set forth in claim 1, wherein said encoder is magnetized along a circumferential direction thereof and said encoder includes S and N poles and non-magnetized areas disposed on a peripheral surface thereof so as to repeat one another at regular intervals along the circumferential direction thereof.

14. The wheel rotation detecting device as set forth in claim 12, wherein said first sensor includes a magnetic detection element and a waveform shaping circuit and said first sensor is free from a permanent magnet.

15. The wheel rotation detecting device as set forth in Claim 1, wherein said second sensor varies a detect signal when an abnormality is present in said rolling bearing unit or a portion adjoining said rolling bearing unit, and

wherein said wheel rotation detecting device further comprises:

a threshold value setting circuit setting a threshold

value in accordance with the rotation speed of said rotary ring detected by said rotation detecting sensor so as to increase said threshold value as said detected rotation speed increases;

5           a comparator for comparing said threshold value input from said threshold value setting circuit with the detect signal of said second sensor; and

10           an abnormality judge circuit for judging the presence or absence of said abnormality in accordance with an output of said comparator.

15           16. The wheel rotation detecting device as set forth in claim 15, wherein said second sensor includes a temperature sensor for detecting the temperature of said rolling bearing unit.

20           17. The wheel rotation detecting device as set forth in claim 15, wherein said second sensor includes a vibration sensor for detecting the vibration of said rolling bearing unit.

18. The wheel rotation detecting device as set forth in claim 3, further comprising:

25           a period analysis circuit for analyzing the period of the vibration detected by said vibration sensor, and outputting

a signal representing said period; and

an abnormality determination circuit for judging the presence or absence of said abnormality in accordance with said signal representing said period and a signal representing the rotation speed of said rotary ring detected by said first sensor.

19. The wheel rotation detecting device as set forth in claim 18, wherein the portion of the rolling bearing unit where a flaking has occurred is specified based on the analyzing result of the period.

20. The wheel rotation detecting device as set forth in claim 17, further comprising:

a variable filter passing a signal detected by said vibration sensor and varying the removing or damping vibration signal in synchronous with the rotation speed.

21. The wheel rotation detecting device as set forth in claim 3, further comprising:

a frequency analysis circuit, after the envelope processing of the vibration signal of said rolling bearing unit detected by said vibration sensor, for analyzing said envelope processed signal, and outputting a signal representing said analyzed signal; and

an abnormality determination circuit for judging the presence or absence of said abnormality in accordance with said signal representing said analyzed signal and a signal representing the rotation speed of said rotary ring detected  
5 by said first sensor.